

Applicants have cancelled Claims 12-14 and 24-35 as relating to non-elected subject matter. Applicants also have cancelled Claims 1-11 and 15-23, and have added new Claims 36-58. The cancellation of Claims 1-11 and 15-23 and the addition of new Claims 36-58 were made in order to provide proper antecedent basis for all claims and to facilitate the review of the pending claims by the Patent Office. Therefore, Applicants do not waive their rights to interpretative equivalents of the new claims, and particularly where elements in the new claims are identical to or are no more narrow than in the original claims. No new matter is contained in the amendments or new claims. Claims 36-58 remain pending for examination. Pursuant to 37 C.F.R. § 1.121, a marked up set of the claims is attached hereto.

I. Election/Restriction Requirement

The Office Action rejected the Applicants' traversal of the restriction requirement and made the restriction requirement final. Accordingly, Applicants have cancelled Claims 12-14 and 24-35 as being directed to nonelected inventions. The Office Action objected to Claims 2-5, 15-17, and 20-23 as referring to sequence listing numbers of nonelected inventions. Applicants have cancelled all original claims, and the new claims do not refer to the sequence listing numbers of the nonelected inventions.

The Office Action also objected to Claims 10 and 11 as being multiple dependent claims in improper form. Applicants have cancelled Claims 10 and 11 and note that the new claims refer to the other claims in the alternative only. Therefore, Applicants respectfully request that these objections to the claims be withdrawn.

II. Rejections under 35 U.S.C. § 112, first paragraph

The Office Action rejected Claims 1-2, 6-11, 15, and 18-20 under 35 U.S.C. § 112, first paragraph, as containing subject matter that is not described in such a manner that would reasonably convey to one skilled in the art that the inventors had possession of the invention at the time the application was filed. More specifically, the Office Action stated that the specification only describes five isolated DNA molecules that encode proteins homologous to known signal transduction proteins and that improve drought stress tolerance when expressed in

transgenic plants, three of which also improve freeze stress tolerance. The Office Action also noted that the application discloses two DNA molecules that encode proteins with homology to phosphoinositide-specific phospholipase C (both of which increase drought stress tolerance when expressed in a transgenic plant, one of which increases freeze stress tolerance when expressed in a transgenic plant). The Office Action stated that this disclosure does not constitute a substantial portion of the genera that comprise STSRP coding nucleic acids, Phospholipase C-2 coding nucleic acids, and orthologs thereof that increase a transgenic plant's tolerance to an environmental stress. The Office Action concluded that the disclosure does not provide an adequate description of the claimed genus such that one skilled in the art would recognize from the disclosure that the Applicants were in possession of the claimed genus.

Applicants respectfully submit that these rejections are mooted by the Applicants' cancellation of Claims 1-2, 6-11, 15, and 18-20. Therefore, Applicants respectfully request that the rejections with respect to the written description requirement be withdrawn.

The Office Action also rejected Claims 1-11 and 15-23 under 35 U.S.C. § 112, first paragraph, as not enabling one skilled in the art to make or use the invention commensurate in scope with the claims. The Office Action noted that the specification discloses that the elected PLC-2 coding nucleic acid when expressed in transgenic *Arabidopsis* plants increases the plant's tolerance to drought and freeze stresses; however, the Office Action concluded that this disclosure is not enabling for transgenic plants comprising other STSRP nucleic acids with tolerance to any environmental stress and for expressing STSRP nucleic acids in a host cell type other than a plant cell.

Applicants have cancelled Claims 1-11 and 15-23. Applicants respectfully submit that new Claim 52 (corresponding to original Claim 18) contains the phrase "plant cell" rather than the phrase "host cell." Applicants respectfully submit that based on the Applicants' present disclosure of the expression of five STSRP coding nucleic acids in a plant sufficiently describes an appropriate level at which to express other STSRP coding nucleic acids in a plant such that the expression results in the plant's increased tolerance to an environmental stress such as drought stress or freeze stress. Everything necessary to practice the invention need not be disclosed; what is well known in the art may be omitted. *See In re Buchner*, 929 F.2d 660, 661,

18 U.S.P.Q.2d (BNA) 1331, 1332 (Fed. Cir. 1991). Applicants respectfully submit that based on the present disclosure, one skilled in the relevant art would be capable of adjusting the level of expression of the STSRP nucleic acid to achieve greater or lesser stress tolerance as desired. Therefore, because the specification would enable one skilled in the art to make or use the invention commensurate in scope with the claims, Applicants respectfully request that the rejections under 35 U.S.C. § 112, first paragraph be withdrawn.

III. Rejections under 35 U.S.C. § 112, second paragraph

The Office Action rejected Claims 1-11 and 15-23 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the Applicants' invention. In particular, the Office Action stated that certain phrases in these claims render the claims indefinite.

The Office Action rejected Claims 1-5, 15-17, and 19-23 as being indefinite in the recitation of "Stress-Related Protein" or "STSRP." Applicants note that in drafting a patent application, the applicant is permitted to be his or her own lexicographer and to use his or her own terminology, provided that it may be understood by one of skill in the art and that the meaning assigned to the term is not repugnant to the term's well known usage. *See In re Hill*, 161 F.2d 367, 73 U.S.P.Q. (BNA) 482 (CCPA 1947); MPEP §§ 608.01(g), 2111.01. Accordingly, Applicants respectfully submit that they are acting as lexicographer in using the terms "Stress-Related Protein" and "STSRP" in order to simplify the specification. Applicants note that these terms are defined in the specification, for example, in paragraph 13 on page 4. The signal transduction stress-related protein (STSRP) coding nucleic acids are defined as those nucleic acids that encode signal transduction proteins and whose expression in a plant cell results in the plant cell's increased tolerance to an environmental stress as compared to a wild type variety of the cell. "Stress-Related Protein" is intended to refer to the fact that the protein is related to an increase in the plant's tolerance to an environmental stress.

The Office Action rejected Claims 1, 11, 18, and 19 as being indefinite in the recitation of "environmental stress." Applicants respectfully submit that the new claims recite

that the environmental stress is selected from one or more of the group consisting of drought and low temperature.

The Office Action rejected Claims 2, 15, and 20 as being indefinite in the recitation of "orthologs thereof." This rejection is mooted by the fact that Applicants have cancelled the original claims, and the new claims do not contain this phrase.

The Office Action rejected Claims 5, 17, and 23 as being indefinite in the recitation of "hybridizes under stringent conditions." Applicants respectfully submit that the new claims recite specific stringent hybridization conditions.

The Office Action rejected Claim 9 as being indefinite in the recitation of "forage crops." Applicants note that "forage crop" appears in new Claim 44. Applicants respectfully submit that what is encompassed by the term "forage crop" would be well known by one of skill in the art. Forage crops include, but are not limited to, Canarygrass, Bromegrass, Wildrye Grass, Bluegrass, Orchardgrass, Alfalfa, Birdsfoot Trefoil, Alsike Clover, Red Clover, and Sweet Clover. *See, e.g.*, National Grassland Research Institute's Illustrated Encyclopedia of Forage Crop Diseases at <http://ss.ngri.affrc.go.jp/disease/detitle.htm>. A hard copy of information from this site is enclosed herewith.

The Office Action rejected Claims 10 and 11 as being indefinite in the recitation of the indefinite article "a" before "plant cell." Applicants respectfully submit that this rejection is mooted by the fact that Applicants have cancelled the original claims.

The Office Action rejected Claim 11 as being indefinite in the recitation of "true breeding." Applicants respectfully submit that new Claim 46 (corresponding to original Claim 11) specifies that the seed comprises the STSRP nucleic acid that was introduced into the parent plant. Applicants also respectfully submit that "true breeding" is defined in the specification in paragraph 35 on pages 7-8 as referring to when a plant is genetically homozygous for a trait to the extent that when the variety is self-pollinated, a significant amount of independent segregation of the trait among the progeny is not observed. A plant "variety" is defined as being a group of plants within a species that share a constant character that separates the variety from the typical form of the species and from other varieties within that species. In this case, the trait

that the claimed variety has in common is the transgenic expression of the STSRP coding nucleic acid.

Claim 19 was rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. Applicants respectfully submit that the new claims include the essential step of expressing the STSRP protein.

Applicants believe that the cancellation of the original claims and addition of the new claims have overcome the rejections under 35 U.S.C. § 112, second paragraph, and therefore, Applicants respectfully request that the rejections under 35 U.S.C. § 112, second paragraph be withdrawn.

#### IV. Rejections under 35 U.S.C. § 101

The Office Action rejected Claim 11 under 35 U.S.C. § 101, as being directed to non-statutory subject matter. The Office Action stated that the claim is not limited to a seed that comprises the STSRP nucleic acid introduced into the parent plant. Applicants respectfully submit that the new Claim 46 (corresponding to original Claim 11) recites that the seed comprises the STSRP nucleic acid introduced into the parent plant. Accordingly, Applicants respectfully request that the objection under 35 U.S.C. § 101 be withdrawn.

#### V. Rejections under 35 U.S.C. § 102

The Office Action rejected Claims 1, 5, 8, 10, 17-19, and 23 under 35 U.S.C. § 102(b), as being anticipated by Fan et al. (The Plant Cell, 1997, 9:2183-96). The Office Action stated that Fan et al. teach that expression of the PLD $\alpha$  nucleic acid in transgenic *Arabidopsis* plants results in increased tolerance to an environmental stress (via an increase in the plant's resistance to abscissic acid and ethylene induced senescence). The Office Action also stated that a PLD $\alpha$  nucleic acid would hybridize under stringent conditions to a polynucleotide as defined in SEQ ID NO:7 because the claims do not limit the hybridization conditions or the length of the nucleic acid that would hybridize.

Applicants respectfully submit that the Fan et al. reference teaches away from the present invention. The Fan et al. reference teaches that the suppression of the PLD $\alpha$  gene through the use of an antisense molecule increases the transgenic plant's resistance to stress-related damage. Applicants' invention teaches that the expression of certain genes results in increased resistance to an environmental stress. Accordingly, the Fan et al. reference does not anticipate the present invention. Applicants also respectfully submit that the PLD $\alpha$  gene as taught by Fan et al. would not be encompassed by the pending claims. Applicants note that a Pairwise BLAST comparison of the two amino acid sequences (PLD $\alpha$  and PLC-2) resulted in a finding of no significant homology. Therefore, Applicants respectfully submit that a PLD $\alpha$  coding nucleic acid would not be expected to hybridize under stringent conditions to a polynucleotide as defined in SEQ ID NO:7. Accordingly, the Fan et al. reference does not anticipate the present invention, and Applicants respectfully request that the rejection under 35 U.S.C. § 102 be withdrawn.

The Office Action rejected Claims 1-2, 5, 6, 8-10, 15, 17-20, and 23 under 35 U.S.C. § 102(b), as being anticipated by Shi et al. (The Plant Journal, 1995, 8(3):381-90). The Office Action stated that because the soybean PI-PLC protein disclosed by Shi et al. is a phospholipase C protein, it is necessarily a PLC-2 ortholog and would be encompassed by the claims. The Office Action also stated that because the soybean PI-PLC protein disclosed by Shi et al. is a phospholipase C protein, a soybean PI-PLC nucleic acid would hybridize under stringent conditions to a polynucleotide as defined in SEQ ID NO:7, and would be encompassed by the claims.

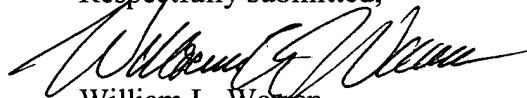
Applicants respectfully submit that Shi et al. do not teach or suggest that expression of the soybean PI-PLC protein would increase a plant's tolerance to an environmental stress. Applicants further submit that the soybean PI-PLC amino acid sequence shows approximately 44% identity with a PLC-2 polypeptide as defined in SEQ ID NO:12. Therefore, Applicants respectfully submit that a soybean PI-PLC coding nucleic acid would not be expected to hybridize under stringent conditions to a polynucleotide as defined in SEQ ID NO:7.

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Accordingly, the Fan et al. reference does not anticipate the present invention, and Applicants respectfully request that the rejection under 35 U.S.C. § 102 be withdrawn.

Applicants believe that the present application, as amended, is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The foregoing is submitted as a full and complete response to the Office Action mailed October 22, 2002. No additional fees are believed to be due, however, the Commissioner is hereby authorized to charge any additional fees due or credit any overpayment to Deposit Account No. 19-5029. If there are any issues that can be resolved by a telephone conference or an Examiner's amendment, the Examiner is invited to call the undersigned attorney at (404) 853-8081.

Respectfully submitted,



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**Marked Up Set of the Claims**

1. (Cancelled) A transgenic plant cell transformed by a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, wherein expression of the nucleic acid in the plant cell results in increased tolerance to an environmental stress as compared to a wild type variety of the plant cell.
2. (Cancelled) The transgenic plant cell of Claim 1, wherein the STSRP is selected from the group consisting of a Phospholipase C-1 (PLC-1) protein; Phospholipase C-2 (PLC-2) protein; a 14-3-3 Protein-1 (14-3-3P-1); a 14-3-3 Protein-2 (14-3-3P-2); and a Ca<sup>2+</sup> Binding Protein-1 (CBP-1); and orthologs thereof.
3. (Cancelled) The transgenic plant cell of Claim 2, wherein the STSRP is selected from the group consisting of PLC-1 as defined in SEQ ID NO:11; PLC-2 as defined in SEQ ID NO:12; 14-3-3P-1 as defined in SEQ ID NO:13; 14-3-3P-2 as defined in SEQ ID NO:14; and CBP-1 as defined in SEQ ID NO:15.
4. (Cancelled) The transgenic plant cell of Claim 2, wherein the STSRP coding nucleic acid is selected from the group consisting of PLC-1 as defined in SEQ ID NO:6; PLC-2 as defined in SEQ ID NO:7; 14-3-3P-1 as defined in SEQ ID NO:8; 14-3-3P-2 as defined in SEQ ID NO:9; and CBP-1 as defined in SEQ ID NO:10.
5. (Cancelled) The transgenic plant cell of Claim 1, wherein the STSRP coding nucleic acid hybridizes under stringent conditions to a sequence of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, or SEQ ID NO:10.
6. (Cancelled) The transgenic plant cell of Claim 1, wherein the environmental stress is selected from the group consisting of salinity, drought and temperature.
7. (Cancelled) The transgenic plant cell of Claim 1, wherein the plant is a monocot.
8. (Cancelled) The transgenic plant cell of Claim 1, wherein the plant is a dicot.

9. (Cancelled) The transgenic plant cell of Claim 1, wherein the plant is selected from the group consisting of maize, wheat, rye, oat, triticale, rice, barley, soybean, peanut, cotton, rapeseed, canola, manihot, pepper, sunflower, tagetes, solanaceous plants, potato, tobacco, eggplant, tomato, Vicia species, pea, alfalfa, coffee, cacao, tea, Salix species, oil palm, coconut, perennial grass and forage crops.
10. (Cancelled) A transgenic plant comprising a plant cell according to any of Claims 1-9.
11. (Cancelled) A seed produced by a transgenic plant comprising a plant cell according to any of Claims 1-9, wherein the seed is true breeding for an increased tolerance to environmental stress as compared to a wild type variety of the plant cell.
12. (Cancelled) An agricultural product produced by the transgenic plant or seed of Claims 10 or 11.
13. (Cancelled) An isolated Signal Transduction Stress-Related Protein (STSRP) wherein the STSRP is selected from the group consisting of a Phospholipase C-1 (PLC-1) protein; a Phospholipase C-2 (PLC-2) protein; a 14-3-3 Protein-1 (14-3-3P-1); a 14-3-3 Protein-2 (14-3-3P-2); and a  $\text{Ca}^{2+}$  Binding Protein-1 (CBP-1); and orthologs thereof.
14. (Cancelled) The isolated STSRP of Claim 13, wherein the STSRP is selected from the group consisting of PLC-1 as defined in SEQ ID NO:11; PLC-2 as defined in SEQ ID NO:12; 14-3-3P-1 as defined in SEQ ID NO:13; 14-3-3P-2 as defined in SEQ ID NO:14; and CBP-1 as defined in SEQ ID NO:15.
15. (Cancelled) An isolated Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, wherein the STSRP coding nucleic acid codes for a STSRP selected from the group consisting of a Phospholipase C-1 (PLC-1) protein; a Phospholipase C-2 (PLC-2) protein; a 14-3-3 Protein-1 (14-3-3P-1); a 14-3-3 Protein-2 (14-3-3P-2); and a  $\text{Ca}^{2+}$  Binding Protein-1 (CBP-1); and orthologs thereof.

16. (Cancelled) The isolated STSRP coding nucleic acid of Claim 15, wherein the STSRP coding nucleic acid is selected from the group consisting of PLC-1 as defined in SEQ ID NO:6; PLC-2 as defined in SEQ ID NO:7; 14-3-3P-1 as defined in SEQ ID NO:8; 14-3-3P-2 as defined in SEQ ID NO:9; and CBP-1 as defined in SEQ ID NO:10.

17. (Cancelled) The isolated STSRP coding nucleic acid of Claim 15, wherein the STSRP coding nucleic acid hybridizes under stringent conditions to a sequence of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, or SEQ ID NO:10.

18. (Cancelled) An isolated recombinant expression vector comprising a nucleic acid of Claims 15, 16 or 17, wherein expression of the vector in a host cell results in increased tolerance to environmental stress as compared to a wild type variety of the host cell.

19. (Cancelled) A method of producing a transgenic plant containing a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, wherein expression of the nucleic acid in the plant results in increased tolerance to environmental stress as compared to a wild type variety of the plant, comprising, transforming a plant cell with an expression vector comprising the nucleic acid, generating from the plant cell a transgenic plant with an increased tolerance to environmental stress as compared to a wild type variety of the plant.

20. (Cancelled) The method of Claim 19, wherein the STSRP is selected from the group consisting of Phospholipase C-1 (PLC-1) protein; a Phospholipase C-2 (PLC-2) protein; a 14-3-3 Protein-1 (14-3-3P-1); a 14-3-3 Protein-2 (14-3-3P-2); and a  $\text{Ca}^{2+}$  Binding Protein-1 (CBP-1); and orthologs thereof.

21. (Cancelled) The method of Claim 20, wherein the STSRP is selected from the group consisting of PLC-1 as defined in SEQ ID NO:11; PLC-2 as defined in SEQ ID NO:12; 14-3-3P-1 as defined in SEQ ID NO:13; 14-3-3P-2 as defined in SEQ ID NO:14; and CBP-1 as defined in SEQ ID NO:15.

22. (Cancelled) The method of Claim 20, wherein the STSRP coding nucleic acid is selected from the group consisting of PLC-1 as defined in SEQ ID NO:6; PLC-2 as defined in

SEQ ID NO:7; 14-3-3P-1 as defined in SEQ ID NO:8; 14-3-3P-2 as defined in SEQ ID NO:9; and CBP-1 as defined in SEQ ID NO:10.

23. (Cancelled) The method of Claim 19, wherein the STSRP coding nucleic acid hybridizes under stringent conditions to a sequence of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, or SEQ ID NO:10.

24. (Cancelled) A method of modifying stress tolerance of a plant comprising, modifying the expression of a Signal Transduction Stress-Related Protein (STSRP) in the plant.

25. (Cancelled) The method of Claim 24, wherein the STSRP is selected from the group consisting of Phospholipase C-1 (PLC-1) protein; a Phospholipase C-2 (PLC-2) protein; a 14-3-3 Protein-1 (14-3-3P-1); a 14-3-3 Protein-2 (14-3-3P-2); and a Ca<sup>2+</sup> Binding Protein-1 (CBP-1); and orthologs thereof.

26. (Cancelled) The method of Claim 25, wherein the STSRP is selected from the group consisting of PLC-1 as defined in SEQ ID NO:11; PLC-2 as defined in SEQ ID NO:12; 14-3-3P-1 as defined in SEQ ID NO:13; 14-3-3P-2 as defined in SEQ ID NO:14; and CBP-1 as defined in SEQ ID NO:15.

27. (Cancelled) The method of Claim 25, wherein the STSRP coding nucleic acid is selected from the group consisting of PLC-1 as defined in SEQ ID NO:6; PLC-2 as defined in SEQ ID NO:7; 14-3-3P-1 as defined in SEQ ID NO:8; 14-3-3P-2 as defined in SEQ ID NO:9; and CBP-1 as defined in SEQ ID NO:10.

28. (Cancelled) The method of Claim 24, wherein the STSRP coding nucleic acid hybridizes under stringent conditions to a sequence of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, or SEQ ID NO:10.

29. (Cancelled) The method of Claim 24, wherein the stress tolerance is decreased.

30. (Cancelled) The method of Claim 24, wherein the plant is not transgenic.

31. (Cancelled) The method of Claim 24, wherein the plant is transgenic.
32. (Cancelled) The method of Claim 31, wherein the plant is transformed with a promoter that directs expression of the STSRP.
33. (Cancelled) The method of Claim 32, wherein the promoter is tissue specific.
34. (Cancelled) The method of Claim 32, wherein the promoter is developmentally regulated.
35. (Cancelled) The method of Claim 24, wherein STSRP expression is modified by administration of an antisense molecule that inhibits expression of STSRP.
36. (New) A transgenic plant cell transformed by a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, wherein expression of the STSRP in the plant cell results in the plant cell's increased tolerance to an environmental stress as compared to a wild type variety of the plant cell, wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature, and wherein the STSRP is a Physcomitrella patens STSRP.
37. (New) The transgenic plant cell of Claim 36, wherein the STSRP is a PLC-2 protein as defined in SEQ ID NO:12.
38. (New) The transgenic plant cell of Claim 36, wherein the STSRP coding nucleic acid comprises a polynucleotide as defined in SEQ ID NO:7.
39. (New) A transgenic plant cell transformed by a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, wherein the STSRP coding nucleic acid hybridizes under stringent conditions to at least one sequence selected from the group consisting of the sequence of SEQ ID NO:7 and the full-length complement of the sequence of SEQ ID NO:7, and wherein

the stringent conditions comprise at least one wash in a 0.2X sodium chloride/sodium citrate (SSC), 0.1% SDS solution at 50oC.

40. (New) The transgenic plant cell of Claim 39, wherein the stringent conditions comprise an initial hybridization in a 6X SSC solution at 45oC followed by at least one wash in a 0.2X SSC, 0.1% SDS solution at 50oC.

41. (New) A transgenic plant cell transformed by a STSRP coding nucleic acid, wherein the STSRP coding nucleic acid comprises a polynucleotide encoding a polypeptide having at least 80% sequence identity with a polypeptide as defined in SEQ ID NO:12.

42. (New) The transgenic plant cell of any of Claims 36, 37, 38, 39, or 41, wherein the plant is a monocot.

43. (New) The transgenic plant cell of any of Claims 36, 37, 38, 39, or 41, wherein the plant is a dicot.

44. (New) The transgenic plant cell of any of Claims 36, 37, 38, 39, or 41, wherein the plant is selected from the group consisting of maize, wheat, rye, oat, triticale, rice, barley, soybean, peanut, cotton, rapeseed, canola, manihot, pepper, sunflower, tagetes, solanaceous plants, potato, tobacco, eggplant, tomato, Vicia species, pea, alfalfa, coffee, cacao, tea, Salix species, oil palm, coconut, perennial grass, and a forage crop.

45. (New) A transgenic plant comprising a plant cell according to any of Claims 36, 37, 38, 39, or 41.

46. (New) A seed produced by a transgenic plant comprising a plant cell according to any of Claims 36, 37, 38, 39, or 41, wherein the seed comprises the STSRP nucleic acid, wherein the seed is true breeding for an increased tolerance to an environmental stress as compared to a wild type variety of the plant cell, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

47. (New) An isolated Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, wherein the STSRP coding nucleic acid comprises a polynucleotide that encodes a polypeptide as defined in SEQ ID NO:12.

48. (New) The isolated STSRP coding nucleic acid of Claim 47, wherein the STSRP coding nucleic acid comprises a polynucleotide as defined in SEQ ID NO:7.

49. (New) An isolated STSRP coding nucleic acid, wherein the STSRP coding nucleic acid hybridizes under stringent conditions to at least one sequence selected from the group consisting of the sequence of SEQ ID NO:7 and the full-length complement of the sequence of SEQ ID NO:7, and wherein the stringent conditions comprise at least one wash in a 0.2X sodium chloride/sodium citrate (SSC), 0.1% SDS solution at 50oC.

50. (New) The STSRP coding nucleic acid of Claim 49, wherein the stringent conditions comprise an initial hybridization in a 6X SSC solution at 45oC followed by at least one wash in a 0.2X SSC, 0.1% SDS solution at 50oC.

51. (New) An isolated STSRP coding nucleic acid, wherein the STSRP coding nucleic acid comprises a polynucleotide encoding a polypeptide having at least 80% sequence identity with a polypeptide as defined in SEQ ID NO:12.

52. (New) An isolated recombinant expression vector comprising an STSRP coding nucleic acid of Claims 47, 48, 49, or 51, wherein expression of the STSRP in a plant cell results in the plant cell's increased tolerance to an environmental stress as compared to a wild type variety of the plant cell, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

53. (New) A method of producing a transgenic plant containing a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, wherein expression of the STSRP in the plant results in the plant's increased tolerance to an environmental stress as compared to a wild type variety of the plant, comprising,

a. transforming a plant cell with an expression vector comprising the nucleic acid; and

b. generating from the plant cell a transgenic plant with an increased tolerance to an environmental stress as compared to a wild type variety of the plant,  
wherein the STSRP is a *Physcomitrella patens* STSRP, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

54. (New) The method of Claim 53, wherein the STSRP is a PLC-2 polypeptide as defined in SEQ ID NO:12.

55. (New) The method of Claim 53, wherein the STSRP coding nucleic acid comprises a polynucleotide as defined in SEQ ID NO:7.

56. (New) A method of producing a transgenic plant containing a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, wherein expression of the STSRP in the plant results in the plant's increased tolerance to an environmental stress as compared to a wild type variety of the plant, comprising,

- a. transforming a plant cell with an expression vector comprising the nucleic acid; and
- b. generating from the plant cell a transgenic plant with an increased tolerance to an environmental stress as compared to a wild type variety of the plant,

wherein the STSRP coding nucleic acid hybridizes under stringent conditions to at least one sequence selected from the group consisting of the sequence of SEQ ID NO:7 and the full-length complement of the sequence of SEQ ID NO:7, wherein the stringent conditions comprise at least one wash in a 0.2X sodium chloride/sodium citrate (SSC), 0.1% SDS solution at 50°C, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

57. (New) The method of Claim 56, wherein the stringent conditions comprise an initial hybridization in a 6X SSC solution at 45°C followed by at least one wash in a 0.2X SSC, 0.1% SDS solution at 50°C.

58. (New) A method of producing a transgenic plant containing a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, wherein expression of the STSRP in the

plant results in the plant's increased tolerance to an environmental stress as compared to a wild type variety of the plant, comprising,

- a. transforming a plant cell with an expression vector comprising the nucleic acid; and
- b. generating from the plant cell a transgenic plant with an increased tolerance to an environmental stress as compared to a wild type variety of the plant,

wherein the STSRP coding nucleic acid comprises a polynucleotide encoding a polypeptide having at least 80% sequence identity with a polypeptide as defined in SEQ ID NO:12, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

# *Illustrated Encyclopedia of Forage Crop Diseases*

## Japanese version

Most forage crops are grasses and legumes. As there are many species of these crop plants, it is characteristic that many kinds of diseases occur on them. We have researched the diseases of forage crops for many years in the plant disease laboratory of NGRI. Now, informations and photographs of the symptoms and causal agents of forage crop diseases are available on the the internet.

When you retrieve from the list of plant names or pathogen names, you will find photographs and explanations of each disease. This time, we add the other items of forage crop diseases and encyclopaedia of fungi. (1998.3.30)

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- Retrieval by disease names
- Retrieval by pathogen names

## Encyclopaedia of fungi

- LINK
- 

Please excuse any imperfections in the English explanations as the translation is made by a machine.

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Tadayuki Shimanuki

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Please click on the plant name.

## Forage crops

- Corn(*Zea mays* L.)
- Sorghum(*Sorghum bicolor* Moench)
- Pearl millet(*Pennisetum americanum* (L.) Leeke)
- Teosint (*Euchlaena mexicana* Schrad.)
- Oat(*Avena sativa* L.)
- Rye(*Secale cereale* L.)

## Grasses

- Orchardgrass(*Dactylis glomerata* L.)
- Ryegrass(*Lolium* spp.)
- Fescue(*Festuca* spp.)
- Timothy(*Phleum pratense* L.)
- Redtop(*Agrostis gigantea* Roth)
- Reed canarygrass(*Phalaris arundinacea* L.)
- Sweet vernalgrass(*Anthoxanthum odoratum* L.)
- Bromegrass(*Bromus* sp.)
- Lovegrass(*Eragrostis* sp.)
- Velvetgrass(*Holcus lanatus* L.)
- Bluestem(*Bothriochloa* sp.)
- Rhodesgrass(*Chloris gayana* Kunth)
- Kikuyugrass(*Pennisetum clandestinum* Hochst. ex Chiov.)
- Fall panicum(*Panicum dichotomiflorum* Michx.)
- Bluepanic(*Panicum antidotale* Retz.)
- Greenpanic(*Panicum maximum* Jacq. var. *trichoglume* Eras)
- Switchgrass(*Panicum virgatum* L.)
- Paspalum(*Paspalum* spp.)
- African millet(*Eleusine coracana* Gaertn.)
- St. Augustine grass(*Stenotaphrum secundatum* (Walt.) O.Kunze)
- Carpetgrass(*Axonopus affinis* Chase.)
- Giant-star-grass(*Cynodon dactylon*)
- Paragrass(*Brachiaria mutica* (Forsk.) Stapf)
- Pangolagrass(*Digitaria decumbens* Stent)
- Centipedegrass(*Eremochloa ophiuroides* (Munro) Hack.)

## Turf grass

- Bluegrass(*Poa* spp.)
- Bentgrass(*Agrostis* spp.)
- Zoysia grass(*Zoysia japonica* Steud.)
- Bermudagrass(*Cynodon dactylon* (L.) Pers.)

## Legumes

- Alfalfa(*Medicago sativa* L.)
- Red clover(*Trifolium pratense* L.)
- White clover(*Trifolium repens* L.)
- Crimson clover(*Trifolium incarnatum* L.)
- Alsike clover(*Trifolium hybridum* L.)
- Subterranean clover(*Trifolium subterraneum* L.)
- Strawberry clover(*Trifolium fragiferum* L.)
- Sweet clover(*Melilotus* sp.)
- Common vetch(*Vicia sativa* L.)
- Hairy vetch(*Vicia villosa* Roth)
- Trefoil(*Lotus* spp.)
- Chinese milk vetch(*Astragalus sinicus* L.)

## Cereals

- Foxtail millet(*Setaria italica* Beauv.)
- Barnyard millet(*Echinochloa crus-galli* P.Beauv. var. *frumentacea* Wight)
- Millet(*Panicum miliaceum* L.)
- Job's tear(*Coix lachryma-jobi* L. var. *ma-yuen* (Roman.) Stapf)
- Adley(*Coix lachryma-jobi* L.)

## Gramineous weeds

### Oryzeae

- Ashi-kaki(*Leersia japonica* Makino)
- Vegetable wild rice(*Zizania latifolia* (Griseb.) Turcz. ex Stapf)

### Poideae

- Big quaking-grass(*Briza maxima* L.)

### Aveneae

- Orange fox-tail(*Alopecurus aequalis* Sobol. var. *amurensis* (Komar.) Ohwi)
- American sloughgrass(*Beckmannia syzigachne* (Steud.) Fern.)

### Arundineae

- Common reed(*Phragmites communis* Trinius)

### Eragrostideae

- Ito-azegaya(*Leptochloa panicea* (Retz.) Ohwi)
- Kaze-kusa(*Eragrostis ferruginea* (Thunb.) Beauv.)
- Goosegrass(*Eleusine indica* (L.) Gaeren.)
- Smutgrass(*Sporobolus fereilis* (Steud.) W.Clayton)

### Cynodonteae

- Shima-hige-shiba(*Chloris barbata* Swartz)

#### Paniceae

- Chijimi-zasa(*Oplismenus undulatifolius* (Ard.) Roem. et Schult.)
- Barnyard grass(*Echinochloa crus-galli* (L.) Beauv.)
- Green bristlegrass(*Setaria viridis* (L.) Beauv.)
- Southern crab-grass(*Digitaria ciliaris* (Retz.) Koel.)
- Violet crab-grass(*Digitaria violascens* Link.)
- Chikara-shiba(*Pennisetum alopecuroides* (L.) Speng.)

#### Andropogoneae

- Euly(*Miscanthus sinensis* Andress.)
- Cogon grass(*Imperata cylindrica* L. var. *koenigii* (Retz.) Pilger in Perk.)
- Ashi-boso(*Microstegium vimineum* (Trin.) A.Camus)
- Okinawa-michishiba(*Chrysopogon aciculatus* Trin.)
- Greek grass(*Arthraxon hispidus* (Thunb.) Makino)

### Other weeds

- Knotweed(*Polygonum thunbergii* Sieb. et Zunc.)
- Buttercup(*Ranunculus acris* L. var. *japonicus* Maxim.)
- Bushclover(*Lespedeza bicolor* Turcz. var. *japonica* Nakai)
- Plantain(*Plantago asitica* L.)
- Golden rod(*Solidago altissima* L.)
- Mugwort(*Artemisia vulgaris* L. var. *indica* Maxim.)
- Asiatic dayflower(*Commelina communis* L.)

□